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Master Thesis

Balancing the Good and the Bad of the EU-Led Liberalisation of the Public Sector

The case of cross-border passenger railway services in the European Union

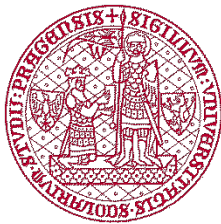
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Balancing the Good and the Bad of the EU-Led Liberalisation of the Public Sector

The case of cross-border passenger railway services in the European Union

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Liberalisation is being implemented in an increasing number of formerly public sectors in European countries, often at the initiative of the European Union. The existing literature effectively highlights both the advantages and disadvantages of liberalisation for the development of these sectors, but stops short of weighing up these positive and negative impacts or analysing how different conditions – such as the level and form of liberalisation implemented and the level of development of the sector in which liberalisation is carried out – influence this balance. This paper constitutes the first step in this direction through its analysis of the case of cross-border passenger railway services. On one hand, one would expect liberalisation to positively impact the development of cross-border passenger railway services through its creation of cross-border markets. On the other hand, however, based on the perceived lowering of the quality of services provided by sectors which undergo liberalisation, one would expect it to result in their deterioration. The paper finds that overall, liberalisation's positive impact outweighs its negative impact in the case of cross-border passenger railway services, as in general it positively influences their development. This applies to all levels and forms of liberalisation. However, this positive impact is found to be dependent on the level of development of the railway sector in which liberalisation is carried out. The effect is much stronger for borders between countries with more well-developed railway sectors than between those with less well-developed railway sectors, where liberalisation appears to have neither a positive nor a negative impact on the development of cross-border services. Overall, therefore, the paper's findings suggest that it is valuable to analyse under what conditions the positive and negative impacts of liberalisation increase and decrease, especially in relation to one another. Further research is required to expand the findings into other sectors and to include different conditions.

Introduction

Since the late 1970s, Europe has seen a wave of deregulation, liberalisation, and privatisation (Clifton, Comín & Fuentes, 2003). From the 1990s onwards, this process has focused primarily on the public sector (Andersen & Sitter, 2007). Industries which traditionally were under public control – such as energy, telecommunications, transport, water and postal services – have been opened up to competition, limiting government involvement in these sectors (Clifton, Comín & Fuentes, 2003). The European Union – and in particular the European Commission – is at the centre of this process through its creation of liberalisation packages (Clifton, Comín & Fuentes, 2006).

The consequences of this EU-led liberalisation process have been analysed in quite some detail. Generally speaking, these studies can be grouped into two categories: those which analyse the – generally positive – effects of liberalisation on efficiency or productivity, and those which study liberalisation's – usually negative – consequences for the quality of the services provided by the sectors in which liberalisation has been carried out. The problem with this current state of the

academic literature on EU-led liberalisation is that it is limited to pointing out either the positive or the negative aspects ('the good and the bad') of liberalisation. Similar to the public debate on liberalisation, where its proponents point to the good and its critics point to the bad, much of the current academic development of the topic appears to constitute the retracing of existing arguments. Although there is great value in understanding whether each of these arguments applies in different situations and sectors, there is little – if any – academic literature which attempts to deal with both arguments simultaneously. This means that the two arguments are never balanced in any way: under certain circumstances, one of liberalisation's effects might clearly outweigh the other, whereas in another situation the consequences on the other side might take precedence.

In most cases, balancing these effects is challenging, as it is difficult to compare consequences in terms of efficiency to those which relate to service quality, as they are often measured in very different terms. Not doing so has become an increasingly large problem, however, due to the diversity in the levels and forms of liberalisation implemented by EU Member States, as well as the fact that liberalisation is carried out in very different contexts due to the differences in the level of development within sectors from one Member State to another. Evidence which points exclusively to liberalisation's benefits or drawbacks can be used to argue either in favour of or against liberalisation, but not for or against the effectiveness of implementing a specific form or level of liberalisation or that of implementing liberalisation at a specific stage of sectoral development.

In order to address these shortcomings, this study focuses on one particular policy domain in which EU-led liberalisation has been applied and which allows for a direct comparison between the respective strengths of the liberalisation's positive and negative effects: cross-border passenger rail. The case of cross-border passenger rail brings liberalisation's two main effects together, as both liberalisation's positive and negative effects can be applied to the same aspect of the case: the development of cross-border passenger railway services (from here on: 'cross-border railway services' or 'cross-border services'). On one hand, the servicing of these connections constitutes an important element of the quality of service which is argued to be reduced as a result of liberalisation. Particularly because cross-border services are expensive to maintain (European Court of Auditors, 2018) and liberalisation often decreases investment in the sector (Warner and Clifton, 2014; Jamasb & Pollitt, 2008), this leads one to expect that liberalisation will deteriorate the servicing of cross-border connections. On the other hand, liberalisation results in efficiency gains through a mechanism which can also be expected to result in the improvement of cross-border railway services. Efficiency gains are generally perceived to result from the creation of markets and market integration (Jamasb & Pollitt, 2005). In the case of the EU, the aim is to create markets not only on a national, but on a European level, and thus to foster market integration on a European scale, where competitors can be active not only in their national market area but across the integrated markets around the EU. One would expect the creation of markets and market integration to improve cross-border railway services, as by integrating the economic activity on both sides of the border, the barriers to the realisation of these services are significantly diminished.

By answering the research question – *What is the effect of liberalisation on cross-border railway services in the European Union?* – this study analyses the balance between the respective impacts of the positive and negative effects of liberalisation in the case of cross-border rail. Moreover, it investigates how the level and form of liberalisation implemented and the level of development of the sector in which liberalisation is carried out influence this balance. The study consists of a large-N panel data study focusing on the development of the number of railway services across all 35 intra-EU borders (with operational railway connections). It uses a novel dataset

which includes the weekly number of services across each border – drawn from the original timetables – as well as the levels, forms, and contexts of liberalisation implemented in each country at four moments in time: 1989, 1999, 2009, and 2019.

The paper begins by highlighting the importance of studying the balance between liberalisation's positive and negative effects under these different conditions in a period in which differentiation between the levels, forms, and contexts of liberalisation implemented in the EU is increasing. It then proceeds to outline liberalisation's two main effects and how they can be applied to the case of cross-border railway services, before explaining how liberalisation, the context in which it is applied, and its impact on cross-border railway services are operationalised. Finally, following a discussion of the results, the paper concludes that in general, liberalisation's positive effect outweighs its negative effect on the development of cross-border railway services. This goes for all implemented levels and forms of liberalisation. However, this effect is dependent on the level of development of the sector in which liberalisation is implemented: when liberalisation is implemented in less well-developed railway sectors, there appears to be little effect on the development of cross-border railway services at all, either positive or negative. Therefore, the results suggest that it is valuable for future research to move beyond highlighting liberalisation's advantages and disadvantages independently of one another and further analyse the possible conditions which determine whether liberalisation can be considered an effective way forward within different sectors.

Literature Review

Differentiated Liberalisation and the Impact of Different Levels, Forms and Contexts of Liberalisation

The scope of the liberalisation process that the European institutions have engaged in since the late 1970s is not to be underestimated. Many industries which traditionally were entirely under public control – such as energy, telecommunications, transport, water and postal services – have been opened up to competition, limiting government involvement in these sectors (Clifton, Comín & Fuentes, 2003). Perhaps the most influential explanation of the cause of this process is that of Giandomenico Majone. Majone (1994) labels the liberalisation process as 'the rise of the regulatory state': an EU-led shift from governance focused on redistribution to governance based primarily on regulation. Majone (1996) argues that the EU's ever-increasing output of regulatory policy – which is possible only in combination with liberalisation and deregulation at a national level – is a result of the fact that the Union has much less scope to act in policy areas which rely on the allocation of resources through taxation and spending. Majone builds on Lowi (1979) in differentiating regulatory policy, which focuses on the use of regulation to guide the activity of both public and private actors in the market, from redistributory policy (transferring resources from one group to another) and distributive policy (allocating public resources to one group of users over another). The key distinction between regulatory policy and the other two is that it does not require the direct expenditure of public funds (Majone, 1996). As Majone points out, given that the EU's budget – in relative terms – is but a fraction of national budgets, it is much easier for the EU to expand in the area of regulation than in any other area, as it does not need to increase its budget in order to do so, particularly because the costs of implementing European regulation are also borne by the Member

States. For that reason, the EU has a natural bias toward focusing on regulatory policy over other types of policy, which can explain its tendency to favour the liberalisation of different sectors (Majone, 1996).

Some argue that this process has resulted in a form of depoliticization of these sectors, through a shift from 'positive' governance to market-supporting regulatory policy. For example, Hartlapp (2019) finds that even regarding social policy, the EU is most active in the area of regulatory social policy – in particular market-supporting regulatory social policy – rather than policies seeking social justice in their own right. Many sectors are increasingly governed primarily by the market and regulatory frameworks, rather than 'positive' governance, in which the state is actively engaged in developing the sector through its public spending choices (Moran, 2001). Such processes of depoliticization have traditionally been legitimised by the belief that they result in both more objective and more informed decision-making (Beveridge, 2012). Politicians and political institutions are not regarded to be objective nor to have the informed knowledge of experts (Hay, 2007). As a result, civil servants and politicians generally have come to adopt a positive tone when referring to depoliticization (Hay, 2007). When applied to the depoliticization that is argued to be achieved through liberalisation, this perceived prospect of greater objectivity and more specialised knowledge is especially strong, as the work of civil servants and politicians is to be taken over by the market, which – following traditional neoliberal theory – maximises the use of specialised knowledge (as originally argued by Hayek (1945)). Until recently, therefore, discussions on the role of the state were often been dominated by the normative argument that the greater influence of non-state actors is by definition an improvement on traditional government (Mayntz, 1998).

In recent years, however, multiple scholars have identified a 're-politicisation' of liberalisation and regulation. Although liberalisation sought to take the politics out of specific areas of decision-making, this process of liberalisation – and in particular, the exact manner in which it is carried out – is becoming increasingly politicised. Krapels (2012) finds that the passing of EU legislation which liberalises formerly public sectors is dependent on the extent to which the prospective liberalisation is politicised and supported by national governments in the negotiation process. This may seem unsurprising, but a crucial change is that Member States also increasingly vary at a national level with regard to the level and form of liberalisation which they implement (Andersen & Sitter, 2007). Market principles are still leading, and the EU continues to liberalise in new areas, but Member States increasingly differ with regard to their regulation of liberalised sectors (Andersen & Sitter, 2007). This development, which Andersen and Sitter refer to as 'fuzzy liberalisation' has two main causes. On the one hand, Member States at times fail to fully implement the EU's directives (Knill & Lehmkuhl, 2000). On the other hand, in an increasing number of cases, Member States go beyond what the EU's directives prescribe, thus liberalising to a greater extent or in a different manner to what is required by the EU on their own initiative (Knill & Lehmkuhl, 2000). In both cases, this is down to the process of liberalisation – with its mixture of positive and negative outcomes – being politicised at a national level, which is why Andersen and Sitter call this development a 're-politicisation' of liberalisation and regulation.

Different levels and forms of liberalisation result in different effects on the sector (Jamasp & Pollitt, 2005; Sánchez, Lorenzo & Martínez, 2008; Cantos, Pastor and Serrano, 2010). For example, Sánchez, Lorenzo and Martínez (2008) find for the railway sector that liberalisation only results in efficiency gains if horizontal separation (a higher level of liberalisation) is implemented, and not when only vertical separation (a lower level of liberalisation) is carried out. Cantos, Pastor and Serrano (2010) find that liberalisation results in greater efficiency gains when entry-level

competition is introduced than when a system of competitive tendering is implemented. Therefore, it is no longer just a question of whether or not to liberalise, but also of both *how much* and *how* to liberalise. If one wants to gain a more nuanced understanding of how liberalisation impacts sectors such as the railway sector, it is necessary to study the impact of different levels and forms of liberalisation on these sectors. However, the existing academic evidence, which points exclusively to liberalisation's benefits or drawbacks, can be used to argue either in favour of or against liberalisation, but not to understand the different impacts of various levels of liberalisation. In order to be able to do so, one needs to be able to strike a balance between liberalisation's positive and negative consequences.

Similarly, another reason why it has become highly relevant to study this balance of liberalisation's strengths and weaknesses is that – even within the EU – liberalisation is being implemented in significantly differing contexts. Even within a single sector, the development of that sector can differ significantly from one Member State to another, particularly now that the EU has expanded Eastward and incorporated ten post-socialist countries. For example, with regard to the railway sector, Tánczos and Bessenyei (2009) find that post-socialist EU Member States in many cases have less well-developed railway sectors, as their infrastructure, stations, and rolling stock are often outdated. Other sectors which are being liberalised or may be liberalised in the future face similar issues, as many of them are services, and many socialist economies were characterised by a repression of the service sector (Bleaney, 1994). Aside from analysing the impact of different levels and forms of liberalisation, it thus also appears very relevant to determine the impact of the level of development of the relevant sector. Once again, this requires a balancing of liberalisation's positive and negative effects.

The Positive and Negative Effects of Liberalisation: Why the Level of Liberalisation is Key

The debate on liberalisation is generally dominated by two opposing arguments: one which stresses the virtues of liberalisation, and one which focuses on its vices. The difficulty with these arguments is that they cannot be directly compared because they focus on different aspects of liberalisation's consequences: one focuses on economic efficiency, the other on the quality of services provided by the sector. Both arguments have considerable scientific evidence to support them. Studies focusing on efficiency generally claim that liberalisation results in greater efficiency; studies concerned with the quality of service most often conclude that service quality is reduced as a consequence of liberalisation. On both sides, the effects are found to arise through a mechanism which suggests that the higher the level of liberalisation implemented, the greater the (possibility of the) effect.

Liberalisation Results in Efficiency Gains

The main argument in favour of liberalisation is that liberalisation lowers consumer prices by increasing efficiency. On a global scale, liberalisation in the aviation sector is found to have resulted in efficiency gains in Asia, the United States, and Europe (Inglada, Rey, Rodríguez-Alvarez & Coto-Millan, 2006). On an EU level, Jamasb and Pollitt (2005) find that in the electricity sector, consumers prices have marginally decreased, suggesting that the liberation of the sector has resulted in a (small) increase in efficiency, which the Commission (2015) claims is a general effect of liberalisation in the EU. The two studies to have been carried out which focus on the effects of liberalisation on efficiency in the railway sector reach a similar conclusion: under some conditions, liberalisation has improved the productivity of the sector, although the studies do not analyse whether this affects consumer prices (Sánchez, Lorenzo & Martínez, 2008; Cantos, Pastor & Serrano, 2010).

What is key, is that the efficiency gains achieved through liberalisation are often found to be dependent on the level of liberalisation implemented. Liberalisation is generally considered to proceed in several steps, with the most sophisticated processes of liberalisation completing all steps, while more limited forms of liberalisation end after an earlier step. The two most important of these steps in network sectors such as rail are: enabling the possibility for competition through separating natural monopoly activities such as infrastructure management from potentially competitive activities such as the operation of services (vertical separation) and creating effective competition through the reduction of the horizontal concentration of company activities (horizontal separation) (Jamasb, 2002; Joskow, 1998; Newbery, 2004).

In arguably the most extensive analysis of liberalisation in a network sector, Jamasb and Pollitt (2005) – focusing on the electricity sector – find that vertical separation is often not enough. They argue that horizontal restructuring of the sector is an important precondition for liberalisation's success in integrating Member States' electricity networks and increasing efficiency in the sector (Jamasb & Pollitt, 2005). In many cases, however, liberalisation efforts are limited to the vertical separation of the production and supply of energy (where competition is possible) from its transmission and distribution (where competition is not possible). In these cases, they find that most often, one company continues to dominate on a national level, as no restructuring was carried out that focused on reducing the horizontal (national) concentration of these companies' activities, and that, therefore, few efficiency gains are realised (Jamasb & Pollitt, 2005). In other words: vertical separation alone falls short of creating any efficiency gains, but vertical separation combined with horizontal separation does result in greater efficiency.

These findings are reinforced by a similar study into the effects of liberalisation in the railway sector. In this 2008 study, Sánchez, Lorenzo and Martínez take into account both vertical and horizontal separation as independent variables. In the railway sector, vertical separation refers to the separation between infrastructure management and servicing, whereas horizontal separation refers to the relationship between the various services. Horizontal separation can be achieved in various ways: the most elaborate is entry-level competition, but some countries also use competitive tendering or franchising (Sánchez, Lorenzo & Martínez, 2008). In other words, horizontal separation refers to the introduction of some form of competitive practice in the industry, whether that is entry-level competition or competition for tenders. Sánchez, Lorenzo and Martínez find that liberalisation increases efficiency in the railway sector, but that these efficiency gains are much greater in countries where both vertical and horizontal separation have been completed than in countries where only vertical separation has been implemented (Sánchez, Lorenzo & Martínez, 2008). Again, efficiency gains are thus found to be dependent on the implementation of a higher level of liberalisation: not just vertical separation, but vertical separation combined with horizontal separation.

Liberalisation Results in a Deterioration of the Quality of Service

On the other hand, however, there is a significant amount of evidence which points to the main negative effect of increasing the degree of liberalisation implemented: the reduction of the quality of the services provided by the sector. In a very extensive study focusing on the electricity sector, postal services, and the healthcare sector, Hermann and Flecker (2013) argue that liberalisation causes a worsening of employment and working conditions through companies holding back investment, which in turn lowers the quality of the services provided. Similarly, Warner and Clifton (2014) identify a 'hollowing out' of formerly public services due to a lack of investment. This causes

service quality to decline and has resulted in public pushbacks against liberalisation, by local governments (primarily on a city level) as well as by citizens.

Similarly to the efficiency effect, the existing research suggests that liberalisation's effect of lowering the quality of services is dependent on the level of liberalisation implemented. This is because this effect appears to be dependent on a reduction in investment. According to another Jamasb and Pollitt study, declining investment stems from private ownership: 'The major behavioural effect of privatisation lies in the incentive to pursue profit through cost saving' (Jamasb & Pollitt, 2008, p. 997). Private ownership can only arise when some level of competition has been introduced to the sector through horizontal separation, because if no horizontal separation has been realised then no new companies (public or private) have been introduced to the sector. Therefore, the higher the level of liberalisation implemented – not just vertical separation, but also horizontal separation – the greater the chances of liberalisation causing the quality of service to decrease.

Comparing the Impact of these Effects: the Case of Cross-Border Railway Services

Both the increases in efficiency and reductions in the quality of service which have been found to be caused by liberalisation are thus dependent on the level of liberalisation which has been implemented. In many cases, these effects can occur simultaneously: more liberalisation can increase the efficiency of a sector while reducing the quality of the services provided by that sector at the same time. For example, Herman and Flecker (2013) claim that any efficiency gains from liberalisation come at the expense of a decline in working conditions as well as in service quality.

What this means is that these studies, while presenting sound arguments for either more or less liberalisation, are not able to provide any indication of how these positive and negative impacts of more or less liberalisation weigh up to one another: no number of these studies will provide an indication of whether the positive or negative impact of liberalisation is the greater. They also do not touch upon the impact of different levels of liberalisation on this balance: at different levels of liberalisation, the balance between the two main effects of liberalisation may well be different too. Potentially, there might be a sweet spot for the level of liberalisation to be implemented in a given sector, where any additional benefits through more liberalisation would be cancelled out by greater impacts on liberalisation's negative side, and – in the opposite direction – where the benefits of less liberalisation would be outweighed by a decline in liberalisation's positive effects.

The case of cross-border railway services offers a rare opportunity to balance these effects. If trains are to take over a greater market share of international travel in the EU, as the Commission envisages (European Commission, 2021), it is crucial that railway services in the EU are expanded, become cheaper, and become more internationally orientated: that the servicing of cross-border connections is increased. Therefore, the Commission aims to create a 'single European railway area' (European Commission, 2021), which represents an 'efficient and competitive EU-wide railway network' (European Commission, 2022). This ideal situation is to be achieved, primarily, through liberalisation. Since 1991, the Commission has created four Railway Packages. These have two main aims: 'gradually opening up rail transport service markets for competition' and 'making national railway systems interoperable' (European Commission, 2021). Both the liberalisation argument and the quality of service argument can be applied to the same aspect of the case of cross-border rail: the level of servicing. However, they suggest contrasting impacts of liberalisation of the railway sector on this level of servicing of cross-border railway connections. With that, the case resembles an opportunity to study the effects side-by-side and analyse which effect is the stronger of the two.

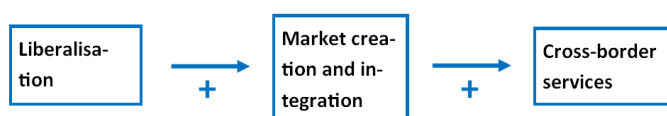
Efficiency Gains through Liberalisation and the Development of Cross-Border Railway Services

On one hand, liberalisation results in efficiency gains through a mechanism which can also be expected to result in the improvement of cross-border railway services. Efficiency gains are generally perceived to result from the creation of markets and market integration (Jamasp & Pollitt, 2005). In the case of the EU, the aim is to create markets not only on a national, but on a European level, and thus to foster market integration on a European scale, where competitors can be active not only in their national market area but across the integrated markets around the EU. This is argued to result in greater efficiency, but that is not our concern here. Of interest for this study is the relationship between the creation of markets and market integration and the development of services across borders, in this case in the railway sector. One can expect the creation of markets and market integration to improve these services, as by integrating the economic activity on both sides of the border, the barriers to the realisation of these services are significantly diminished.

The extent to which this happens is likely to be dependent on the level of liberalisation implemented. Three different forms of liberalisation in the railway sector can be identified. On the one hand, there is vertical separation, which was introduced with Directive 91/440 in 1991. This form of liberalisation separates infrastructure management from the operation of services. In its 1998 review of this directive, the Commission highlighted that previously, the development of cross-border railway services was significantly hampered by the fact that markets were limited to the national level. Because operators could only run services as far as the border, and then would have to pass over the service to another operator, costs were high due to the short length of the trips made by both operators individually (European Commission, 1998). With vertical separation, this situation is improved somewhat, as now operators can cooperate to run a single service (for example: *Thalys* in Belgium and France, which was jointly owned and operated by the French and Belgian national railway companies), as this servicing is disconnected from the infrastructure, which is tied to national control.

The next step is horizontal separation, which refers to the provision of the services themselves. Without horizontal separation, all services are run by the same operator; with horizontal separation the market is opened up to competition. Horizontal separation can be achieved in two different manners: competitive tendering, where operators bid for the monopoly of servicing a certain line, and entry-level competition, where operators compete directly by both offering services on the same line. Market creation and integration through horizontal separation further increase the opportunities for cross-border railway services, as with horizontal separation a single operator can run a service on both sides of the border (for example: the *Arriva* services between Germany and the Netherlands, operated by the German national operator).

The argument that liberalisation increases efficiency, through its reliance on the influence of the creation of markets and market integration, thus also suggests that higher levels of liberalisation will result in the improvement of cross-border railway services. The latter relationship is modelled below, along with the first hypothesis which can be drawn from the model.



- H1: Higher levels of liberalisation improve the development of cross-border railway services in the European Union.

Deterioration of the Quality of Service through Liberalisation and the Development of Cross-Border Railway Services

On the other hand, liberalisation results in declines in the quality of the services. The main mechanism through which these declines in quality of service are argued to result from liberalisation is that liberalisation results in a decline in investment as a result of competition, which forces institutions turned private companies to be prudent with the money that they spend. The servicing of cross-border connections also constitutes an important element of the quality of service which may be reduced as a result of greater levels of liberalisation. This would lead one to expect that liberalisation will deteriorate the level of servicing of cross-border connections, contrary to what the efficiency argument suggests. This expectation is strong for cross-border services in particular because they are expensive to maintain (European Court of Auditors, 2018) and liberalisation often decreases investment in the liberalised sector (Warner and Clifton, 2014; Jamasb & Pollitt, 2008). With lower levels of investment, cross-border services are likely to be the first to be negatively impacted due to their high costs to run.

This effect is unlikely to be strong for vertical separation alone, as this will have little impact on investment, as vertical separation alone does not introduce competition in any way. When horizontal separation is introduced, however, this effect is likely to be stronger, as there will be competition and with that more cost-cutting.

Once again, the model of the relationship is displayed below, which in this case suggests that higher levels of liberalisation will result in a deterioration of the servicing of cross-border railway services. The corresponding hypothesis is included below the model.



- H2: Higher levels of liberalisation deteriorate the development of cross-border railway services in the European Union.

The Impact of Different Forms of Liberalisation

The literature thus leads us to draw up two competing hypotheses with regard to the effect of the implementation of higher levels of liberalisation. We now turn to the effects of different forms of liberalisation: in particular, the two different forms of horizontal separation. In a system of competitive tendering, operators bid for the monopoly of servicing a certain line, whereas when entry-level competition is present, operators compete directly on the same service. Both forms of horizontal separation allow for a single operator to run on both sides of a border, as discussed previously. Thus, their respective positive effects on the development of cross-border services are likely to be similar. On the negative side, however, this is not the case. In a system of entry-level competition, competition is ever-present, as opposed to only in multi-year tender bidding processes in a competitive tendering system (Sánchez, Lorenzo & Martínez, 2008). This means that the effect described previously – where competition leads to cost-cutting, which in turn results in a decline in the quality of service and deterioration of cross-border services – is likely to be stronger in a system of entry-level competition than in a system of competitive tendering. As a result, the balance between the two effects of liberalisation is likely to be tilted toward the positive side with the

implementation of competitive tendering rather than entry-level competition as a form of horizontal separation. This expectation is formulated in hypothesis 3.

- H3: Liberalisation based on a system of competitive tendering has a more positive effect on the development of cross-border railway services in the European Union than liberalisation based on a system of entry-level competition.

The Impact of Different Contexts of Liberalisation

Finally, the context in which liberalisation is carried out is important because the level of development of the railway sector in general is likely to be a key determinant of the effects of liberalisation, including that on the development of cross-border railway services. This is because the lower the level to which a sector is developed, the higher the level of investment that is required in the sector. As discussed in the section on the literature on liberalisation's negative impact on the quality of services, liberalisation has a tendency to result in a decline in this investment (Warner and Clifton, 2014; Jamasb & Pollitt, 2008). Therefore, one would expect liberalisation's impact of a decline in the quality of service and deterioration of cross-border services to be stronger in the case of Member States with less well-developed railway sectors. The balance between the two effects of liberalisation is therefore expected to be tilted toward the positive side in Member States with more well-developed railway sectors. Hypothesis 4 is based on this expectation.

- H4: Liberalisation has a more positive effect on the development of cross-border railway services in the European Union between countries with more well-developed railway sectors than between those with less well-developed railway sectors.

Research Design

Units of Analysis

A large-n design is the format best suited to the testing of these hypotheses because the relationship between liberalisation and cross-border railway services is likely to be a relatively weak and contingent one. Railway sector liberalisation is neither a necessary nor a sufficient condition for the improvement or deterioration of these services. Therefore, the study will include all borders between the EU Member States of 2019 which had railway services running across them at some point in the period under analysis. There are 35 such borders.

We are interested in determining how the number of railway services across all of these borders developed over time. By incorporating this temporal element, the study will be able to make a better estimation as to whether any correlations between different levels of liberalisation and the number of cross-border railway services actually represent a causal relationship. Specifically, it will focus on the levels of liberalisation and the number of services at four different moments, with ten-year intervals between them: 1989, 1999, 2009, and 2019. The 1989-2019 timeframe has been selected because the first moment (1989) lies just before the beginning of the liberalisation process in 1991, when Directive 91/440 was introduced, and because using 2019 as an endpoint of the temporal analysis avoids incorporating the COVID-19 crisis, which heavily impacted cross-border railway services. Because all countries started from a point of no liberalisation in 1989 and then

liberalised at different moments and to different levels, the research uses a difference-in-difference design. In total, cross-border railway services will therefore be analysed across 35 borders at 4 moments in time, resulting in a total of 140 observations.

Finally, it is worth noting that many of the current EU Member States were not part of the Union in (some of the) previous moments in time under analysis. In the context of this paper, this will be considered to be an advantage rather than a potential difficulty, as it adds more differentiation with regard to the levels of liberalisation carried out over time, because these countries only liberalised their railway sectors either just before or after joining the EU. Additionally, two of the current borders between these countries lay within the same country in 1989 (Czech Republic – Slovakia, Croatia – Slovenia). The emergence of these borders may have had a slight impact on the development of railway services, but this is not assumed to be significant in the scale of the research as a whole.

Operationalisation of Variables

Dependent Variable: Cross-Border Railway Services

The dependent variable – cross-border railway services – will be operationalised by analysing the number of weekly cross-border railway services across national borders. In this way, both the number of physical connections and their level of servicing are taken into account: together they determine the overall level of servicing.

Independent Variable: Liberalisation – Levels and Forms

The independent variable – liberalisation – will be operationalised using several ranking systems which aim to take into account the different levels and forms of liberalisation. As discussed previously, the main elements of liberalisation are vertical separation and horizontal separation, in which horizontal separation constitutes a higher level of liberalisation than vertical separation, because horizontal separation relies on vertical separation in order to be implemented. Both vertical and horizontal separation can in turn be implemented at different *levels*. Additionally, there are two separate *forms* of horizontal separation.

Regarding vertical separation, the current legislative core of the EU's liberalisation program in the railway sector is Directive 91/440, introduced in 1991, which obliged Member States to separate the management of railway infrastructure from the operation of services (Cantos, Pastor & Serrano, 2010). This is a very mild form of vertical separation, and many Member States have gone much further than this (Knill & Lehmkuhl, 2000). Following Sánchez, Lorenzo and Martínez (2008), there are three different levels of vertical separation which will be used to categorise all Member States' railway sectors: no vertical separation, administrative separation, and institutional separation.

Again following Sánchez, Lorenzo & Martínez (2008), two different *forms* of horizontal separation can be realised. In a system of competitive tendering, operators bid for the monopoly of servicing a certain line. Alternatively, operators compete directly on the same service in a system of entry-level competition. Competitive tendering cannot be further separated into levels, but entry-level competition can be. The key distinction within entry-level competition is that between the existence of *de jure* competition and *de facto* competition (Sánchez, Lorenzo & Martínez, 2008). Although all countries which joined the EU in or after 2004 allowed for entry-level competition in their legislation, not many of them succeeded in the creation of entry-level competition in practice at the time. The effects between these two states of the sector are likely to be different, and they

will therefore be distinguished in the study. Three levels of entry-level competition can thus be distinguished: no entry-level competition, de jure entry-level competition, and de facto entry-level competition.

Independent Variable: Liberalisation – Rankings Across Borders

Displayed in the tables below are the different rankings which will be used to score the level of liberalisation implemented. The first is for the different levels of liberalisation in general (none, vertical separation, horizontal separation). The second and third are similar, but focus specifically on one of the two forms of horizontal separation: competitive tendering and entry-level competition. Finally, the fourth ranking focuses on the different levels of vertical separation in cases where no horizontal separation is implemented at all. Because the dependent variable is operationalised at border-level, these rankings also need to be made at border-level rather than at country-level, which requires making a combination of the liberalisation implemented in the countries on both sides of the border. An important consideration here is that all hypothesized advantages of liberalisation for cross-border services rely on cross-border separation being present on both sides of the border rather than just one, as they relate to services being run across a border through cooperation between two companies that are disconnected from infrastructure management, or a service being run across a border by a single company (as described in the literature review). Therefore, in these rankings of the levels of liberalisation, it is the lower level of liberalisation of the two countries which determines the position in the ranking.

The general ranking (Table 1) incorporates both vertical and horizontal separation, without further specifying the levels at which or types of which either have been introduced. This ranking is used to determine whether increasing the overall level of liberalisation from no liberalisation to vertical separation to horizontal separation impacts the development of cross-border railway services, in either a positive or a negative manner. In this ranking, both accounting separation and institutional separation are taken to indicate the presence of 'Vertical Separation', and any form of horizontal separation – competitive tendering or entry-level competition, either de jure or de facto – is taken to indicate the presence of 'Horizontal Separation'.

The analysis using this general ranking will provide an overall indication of the effect of liberalisation on the development of cross-border railway services, but does not take into account differences between different *types* of horizontal liberalisation (competitive tendering and entry-level competition). Therefore, the next step is to take a closer look at the respective effects of the two main types of horizontal liberalisation: competitive tendering and entry-level competition. Two separate rankings are created that focus only on either competitive tendering (Table 2) or entry-level competition (Table 3), including the different levels in the latter case (de jure and de facto entry-level competition). Vertical separation is included in both rankings as it is the lower level of liberalisation which is required for the development of any form of horizontal separation.

Finally, vertical separation itself can also be introduced at different levels: accounting and institutional separation. In cases where vertical separation has resulted in horizontal separation, this distinction is of little importance, as once horizontal separation has been created then its effects will overrule any distinctions between different levels of vertical separation: regardless of these differences, vertical separation has served its purpose by allowing for the creation of a form of competition. However, as discussed previously, vertical separation alone – without the presence of horizontal separation – can also affect the development of cross-border services by enabling cooperation between different operators without their having to cooperate with regard to

infrastructure management. However, this effect may be stronger for higher levels of vertical separation (institutional) than for lower levels (accounting). Therefore, a final ranking focuses on vertical separation and its different levels alone (Table 4). This ranking will only be applied in those cases where no horizontal separation was realised.

Table 1 – General Liberalisation Ranking

Ranking	Levels of Liberalisation (Country A/Country B)
0	No Liberalisation/No Liberalisation No Liberalisation/Vertical Separation No Liberalisation/Horizontal Separation
1	Vertical Separation/Vertical Separation Vertical Separation/Horizontal Separation
2	Horizontal Separation/Horizontal Separation

Table 2 – Competitive Tendering Ranking

Ranking	Levels of Competitive Tendering (Country A/Country B)
0	No Liberalisation/No Liberalisation No Liberalisation/Vertical Separation No Liberalisation/Competitive Tendering
1	Vertical Separation/Vertical Separation Vertical Separation/Competitive Tendering
2	Competitive Tendering/Competitive Tendering

Table 3 – Entry-Level Competition Ranking

Ranking	Levels of Entry-Level Competition (Country A/Country B)
0	No Liberalisation/No Liberalisation No Liberalisation/Vertical Separation No Liberalisation/De Jure Entry-Level Competition No Liberalisation/De Facto Entry-Level Competition
1	Vertical Separation/Vertical Separation Vertical Separation/ De Jure Entry-Level Competition Vertical Separation/ De Facto Entry-Level Competition
2	De Jure Entry-Level Competition/ De Jure Entry-Level Competition De Jure Entry-Level Competition/De Facto Entry-Level Competition
3	De Facto Entry-Level Competition/De Facto Entry-Level Competition

Table 4 – Vertical Separation Ranking

Ranking	Levels of Vertical Separation (Country A/Country B)
0	No Liberalisation/No Liberalisation No Liberalisation/Accounting Separation No Liberalisation/Institutional Separation
1	Accounting Separation/Accounting Separation Accounting Separation/Institutional Separation
2	Institutional Separation/Institutional Separation

Moderator Variable: Development of the Railway Sector

The study will also include the possible effect of the context in which liberalisation is implemented, focusing on how well-developed the railway sectors in which liberalisation is implemented are. In order to operationalise more and less well-developed railway sectors, the study will distinguish between Member States which are post-socialist and those which are not. Post-socialist economies tend to have less well-developed service sectors such as rail because socialist economies were characterised by a repression of the service sector (Bleaney, 1994). In the railway sector specifically, Tánczos and Bessenyei (2009) find that post-socialist EU Member States struggle with outdated infrastructure, stations, and rolling stock. Although there are of course differences between the railway sectors of both individual post-socialist and individual Member States that are not post-socialist, this distinction well represents differences on a macro-level. Therefore, the study will operationalise the sectoral context in which liberalisation is applied by determining for the countries on both sides of the border whether or not they are post-socialist. For each border, there are three possibilities: either both countries are post-socialist, or neither, or just one.

Control Variables

Finally, in order to ensure that the development of cross-border railway services is not collinear with the development of the railway sectors on both sides of the borders as a whole, the study will control for the total track lengths of the national railway networks. The track lengths will be combined in order to achieve another ‘score’ for each border. Additionally, to ensure that the changes in the servicing of cross-border connections are not *just* down to the establishment of new physical cross-border connections or the closure of existing connections, which obviously bring about big changes in the development of the number of services, the study will also control for the number of physical connections across each border. Characteristics of the borders themselves, such as geography and the length of the borders, do not have to be controlled for as these characteristics stay consistent over time and their effect is thus controlled for through the use of the difference-in-difference research design.

Data Collection

In order to conduct this study, a new dataset will need to be constructed. The data on the cross-border services will be drawn manually from the Thomas Cook European Timetables (since 2013: European Rail Timetables) for the years under analysis. Data on the levels of liberalisation will be deduced from a combination of past academic studies such as that of Sánchez, Lorenzo and Martínez (2008) and reports such as 2021’s European Mobility Atlas by the Heinrich Boll Stiftung and the Rail Liberalisation Index 2011 by IBM and Kirchner. The complete list of sources can be found below the table in Appendix 1.

Results

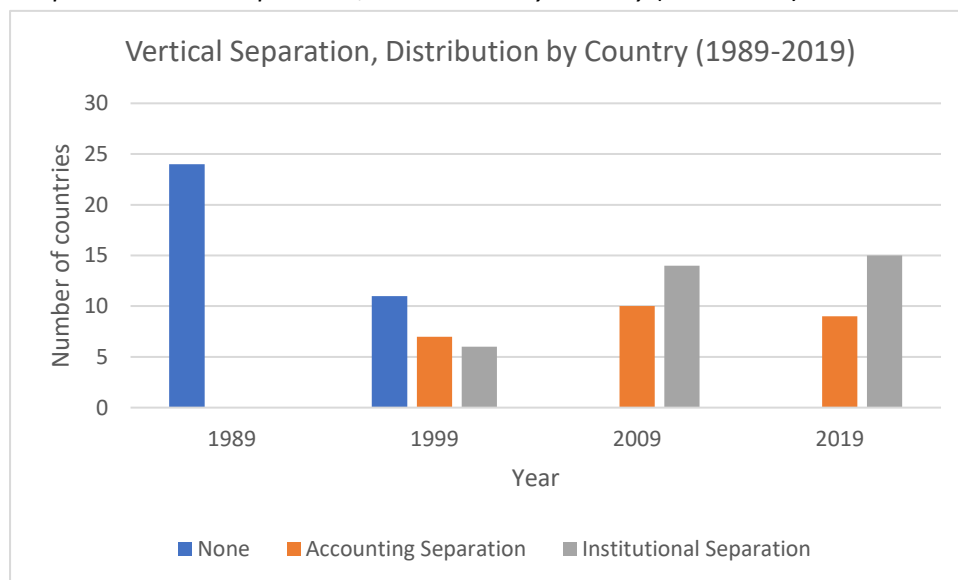
Descriptive Statistics

Liberalisation

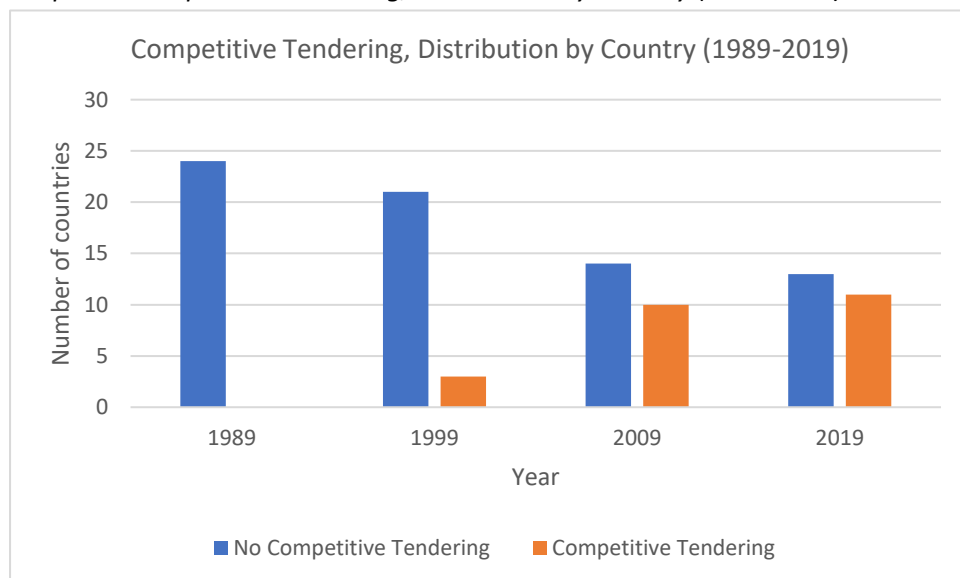
In 1989, no European countries had liberalised their railway sectors. By 2019, a lot had changed: all countries which shared cross-border railway connections with another Member State had carried out some form of vertical separation and almost half had introduced competitive tendering. Moreover, the majority of these countries allowed for entry-level competition, with de facto entry-level competition becoming a reality in over a third. The graphs below display the development of vertical separation (Graph 1), competitive tendering (Graph 2), and entry-level competition (Graph 3) separately. As can be read from the graphs, vertical separation of either the accounting or the institutional type was introduced everywhere before 2009, including Croatia, which at the time was not yet in the EU. Where this process was a steady development between liberalisation’s beginnings and 2009, horizontal separation only really took off after 1999. Competitive tendering was introduced primarily between 1999 and 2009, while de jure entry-level competition was also mainly realised between 1999 and 2009, but it was between 2009 and 2019 that several of the countries which had introduced de jure entry-level competition realised de facto entry-level competition. Four Member States had already done so before 2009.

Together, the three graphs suggest that most progress in the liberalisation process was made in the period between 1999 and 2009. This is because this is the period in which extensive developments were made with regard to both vertical separation and the two forms of horizontal separation: competitive tendering and entry-level competition. The development of all forms and levels of liberalisation in each individual country is displayed in Appendix 1.

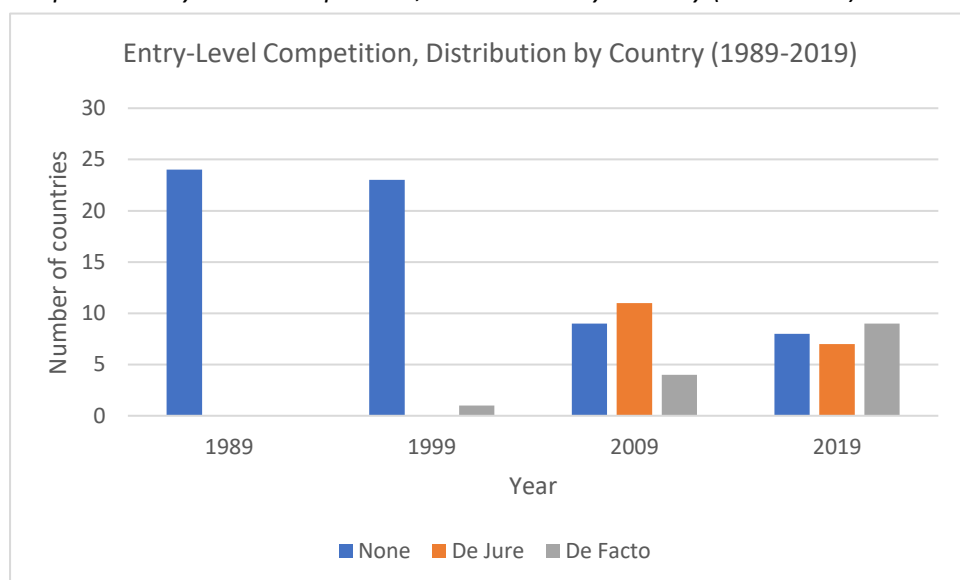
Graph 1 – Vertical Separation, Distribution by Country (1989-2019)



Graph 2 – Competitive Tendering, Distribution by Country (1989-2019)



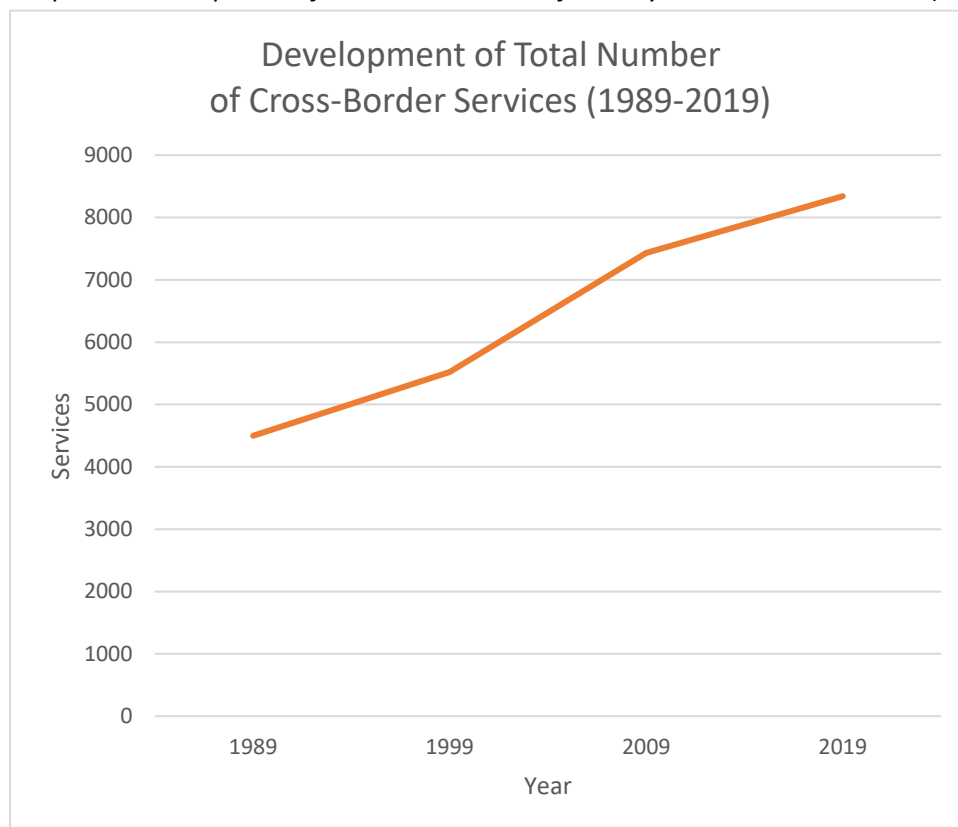
Graph 3 – Entry-Level Competition, Distribution by Country (1989-2019)



Cross-border Railway Connections

The following graph shows the development of the total number of weekly cross-border services (Graph 4). The strongest increase in the number of services appears to take place in the 1999 to 2009 period: the same period as that in which liberalisation developed most rapidly. Smaller increases are realised between 1989 and 1999 and 2009 and 2019. The development of the number of services across each individual border is displayed in detail in Appendix 2.

Graph 4 – Development of the Total Number of Weekly Cross-Border Services (1989-2019)

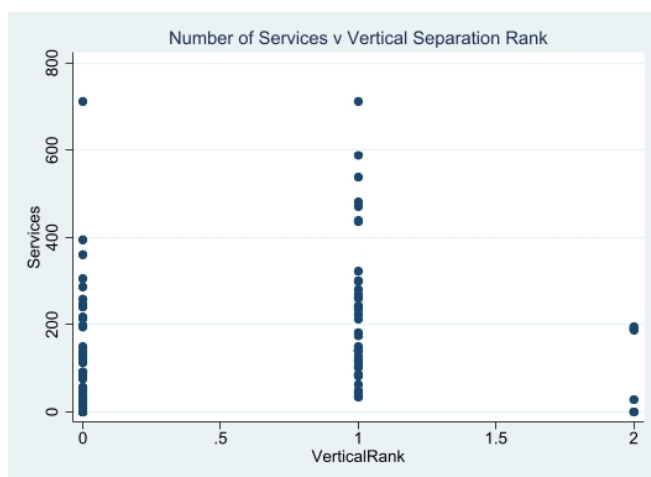
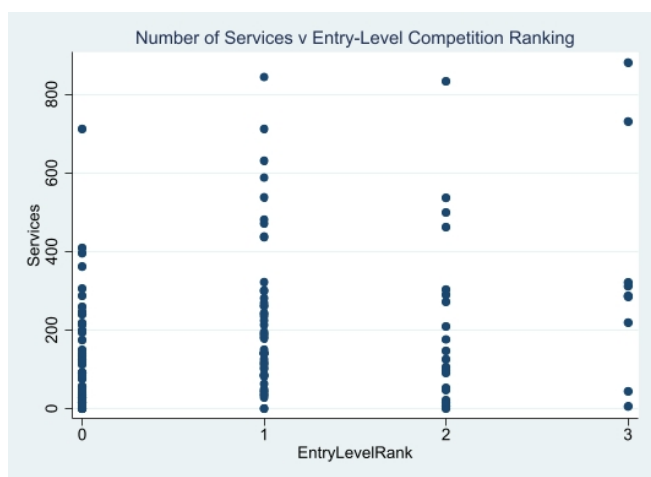
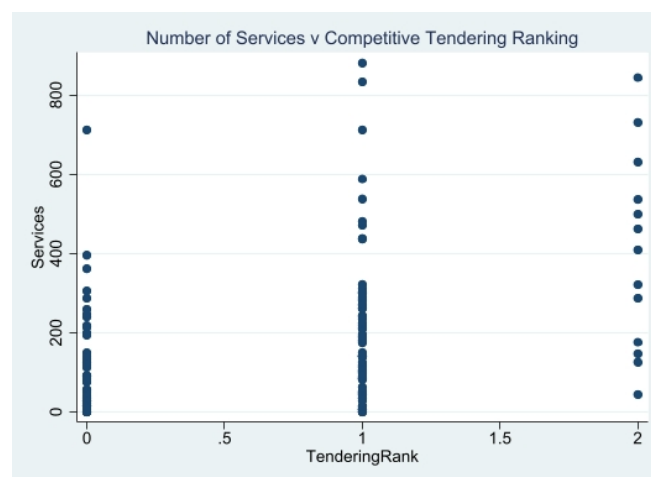
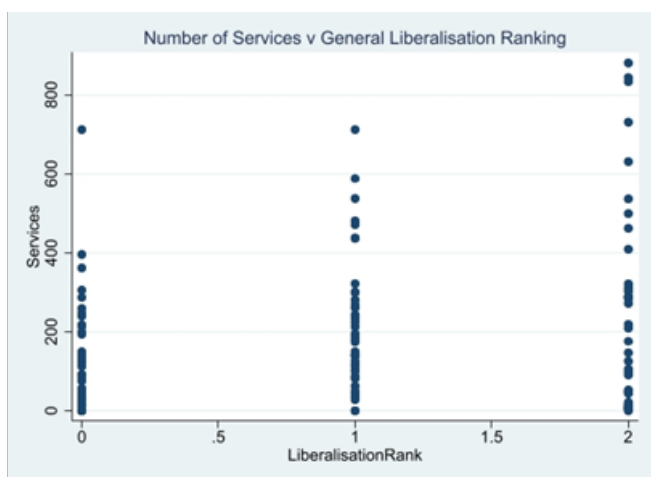


Analytical Statistics

The data represents a form of panel data, which can be analysed with either a fixed effects model or a random effects model. Because variation between the numbers of services depends on many things which are not included as independent variables in the analysis, such as length and geography of borders, it is unlikely that differences between the numbers of services across different borders at any given point are correlated with the independent variables under analysis, and thus it is unlikely that the effects studied represent fixed effects. This was confirmed using a Hausman test, which indicated that a random effects model fits the data better than a fixed effects model.

Moreover, although the distribution of services is skewed to the right, it does not make sense to use the natural logarithm of services in the analysis. This is because – contrary to other, more heavily skewed variables such as income – we are interested in additive changes throughout the scale, rather than multiplicative ones. Moreover, the scatterplots between services and the different liberalisation rankings – the general liberalisation ranking, competitive tendering ranking, entry-level competition ranking, and vertical separation ranking (Tables 1 to 4) – suggests that the distribution of errors does represent a normal distribution, as there is little evidence of there being more or greater outliers on one end of the scale than on the other (Graphs 5 to 8). Thus, there does not appear to be any evidence of heteroskedasticity.

Graphs 5-8 – Scatterplots for the Number of Services v the Liberalisation Rankings (see Tables 1 to 4)



General Relationship and the Impact of Different Levels of Liberalisation

We begin by analysing the general effect of liberalisation and increasing the level of liberalisation. As determined previously, the main levels of liberalisation are no liberalisation, vertical separation, and horizontal separation. These three levels are used to create the general liberalisation ranking (Table 1). This ranking is used in Model 1 (Table 5), which indicates that both liberalisation in general and higher levels of liberalisation positively impact the development of the number of cross-border railway services. A one-unit increase in the general liberalisation ranking results in a 57.46 unit increase in the number of cross-border railway services ($P < 0.01$).

The Impact of Different Forms of Liberalisation

We now turn to the effect of different forms of liberalisation. As discussed, two different forms of liberalisation can be implemented at the level of horizontal separation: competitive tendering and entry-level competition. In Model 1, these were grouped together as horizontal separation, with the presence of either form indicating the implementation of horizontal separation. In Models 2 and 3 (Table 5), they are analysed independently of one another, using the competitive tendering ranking and entry-level competition ranking respectively (Tables 2 and 3). As described in the methodology section, the entry-level competition ranking also takes into account the different levels of entry-level competition: de jure and de facto entry-level competition. Models 2 and 3 indicate that higher levels

of liberalisation positively impact the development of cross-border railway services both when the highest level of liberalisation – horizontal separation – takes the form of competitive tendering and when it takes the form of entry-level competition. A one-unit increase in the competitive tendering ranking results in an 83.37 unit increase in the number of cross-border railway services ($P < 0.01$) and a one-unit increase in the entry-level competition ranking results in a 52.08 unit increase in the number of cross-border railway services ($P < 0.01$). These coefficients are not directly comparable due to the different lengths of the scales: the entry-level competition ranking is longer, which might explain why the coefficient is lower.

Table 5 – Models 1, 2, and 3

VARIABLES	(Model 1) Services	(Model 2) Services	(Model 3) Services
LiberalisationRank	57.46*** (16.01)		
TenderingRank		83.37*** (20.58)	
EntryLevelRank			52.08*** (14.30)
Constant	134.58*** (23.32)	125.88*** (24.50)	137.74*** (24.30)
Observations	140	140	140
Number of ID	35	35	35

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The Impact of Control Variables

Next, we turn to analyse whether these effects stand the test of adding control variables to the model. As described in the previous section, total track length development in the two countries on both sides of the border needs to be controlled for in order to ensure that the development of cross-border railway services is not collinear with the development of these countries' respective railway sectors as a whole. Moreover, the number of physical connections on both sides of the border is controlled for to be sure that changes in the servicing of cross-border connections are not down to the establishment of new physical cross-border connections or the closure of existing connections alone, as these are of course developments which bring about big changes in the development of the number of services. Both controls are included in Models 4, 5, and 6 displayed below (Table 6). These models are the same as Models 1, 2, and 3, but with the addition of the two control variables. They indicate that in all three cases, the coefficients drop but remain positive and statistically significant. For each unit increase in the general liberalisation ranking, the number of cross-border services increases by 31.91 ($P < 0.05$), as opposed to 57.46 in the model without control variables. In the competitive tendering and entry-level competition models, the coefficients drop from 83.37 and 52.08 to 45.77 ($P < 0.05$) and 27.08 ($P < 0.05$) respectively. In all three cases, the effect of the number of physical cross-border connections is highly significant, with coefficients between 54 and 57 ($P < 0.01$), while the total length of tracks has no effect at all. It can therefore be concluded that the development of the number of physical cross-border connections is partly responsible for the

development of the number of cross-border services, but definitely not entirely: the effect of liberalisation remains highly significant.

Table 6 – Models 4, 5, and 6

VARIABLES	(Model 4) Services	(Model 5) Services	(Model 6) Services
LiberalisationRank	31.91** (13.80)		
Connections	56.45*** (8.20)	55.16*** (8.79)	54.84*** (8.34)
TrackLengthCombined	0.00** (0.00)	0.00* (0.00)	0.00** (0.00)
TenderingRank		45.77** (18.61)	
EntryLevelRank			27.08** (10.89)
Constant	-63.23* (35.31)	-57.52* (34.46)	-60.31* (35.07)
Observations	101	101	101
Number of ID	35	35	35

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Vertical Separation - Different Levels of Liberalisation

Not only entry-level competition can be introduced at different levels, but the same also goes for vertical separation, as a country can either implement accounting or institutional separation. These levels of vertical separation are ranked in the vertical liberalisation ranking (Table 4). As discussed in the methodology section, this distinction is only of importance in situations where no horizontal separation has been implemented. In order to test whether higher levels of vertical separation have greater effects on the development of cross-border services, Model 7 (Table 7) is therefore created, based only on those observations where there is no horizontal separation present. It indicates that in general, higher levels of vertical separation positively impact the development of the number of cross-border railway services. A one-unit increase in the vertical separation ranking results in a 35.89 unit increase in the number of cross-border railway services ($P < 0.05$). In Model 8 (Table 8), the same controls are added as in Models 2, 3, and 4. As a result, the coefficient drops slightly to 29.57, but remains statistically significant ($P < 0.05$).

Table 7 – Model 7

VARIABLES	(Model 7) Services
VerticalRank	35.89** (17.52)
Constant	136.86*** (23.91)
Observations	105
Number of ID	35

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8 – Model 8

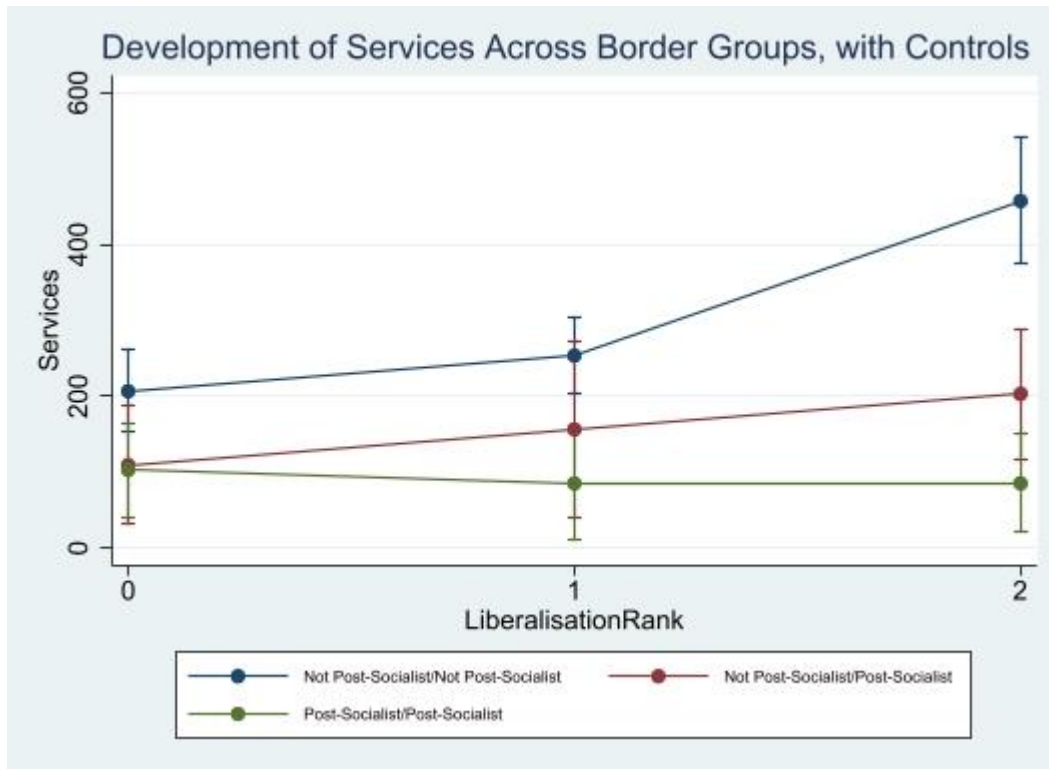
VARIABLES	(Model 8) Services
VerticalRank	29.57** (14.93)
Connections	48.13*** (9.98)
TrackLengthCombined	0.00 (0.00)
Constant	-11.59 (32.79)
Observations	75
Number of ID	35

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The Impact of Different Contexts of Liberalisation (Moderation)

We now turn to the effect of the context in which liberalisation is carried out: the level of development of the railway sector, as operationalised by indicating whether a country is a post-socialist economy or otherwise. A final model is created (including the controls) which also includes an interaction effect between the overall level of liberalisation and the context in which liberalisation was implemented. There does indeed appear to be a strong interaction effect present, which is best depicted by the graph displayed below (Graph 9). The positive effect of the overall level of liberalisation on the development of the number of cross-border services is clearly stronger for borders between two countries which are not post-socialist or for borders between one country which is post-socialist and one which is not than for borders between two post-socialist countries. In the latter case, there is virtually no effect present. Thus, the level of development of the railway sector in which liberalisation is introduced acts as a moderator variable in the relationship between liberalisation and the development of cross-border railway services.

Graph 9 – Development of Services Across Border Groups, with Controls (Liberalisation Ranking in Table 1)



Finally, these models are tested for a final possible misspecification error. As these models are based on panel data, it is important to check for serial correlation, which is present when there is a relationship between a given variable and a lagged version of itself over various time intervals. This does not appear to be an issue in any of the models presented.

Conclusion

Given the prevalence of liberalisation as an EU-level strategy for the development of sectors which were previously under public control, it is important that a nuanced understanding of liberalisation's consequences is realised. Currently, many studies exist which analyse specific effects of liberalisation, both positive and negative. However, these studies generally only highlight *either* a positive or negative side of liberalisation. They provide indisputable evidence that liberalisation has both advantages and disadvantages, but what is lacking is a sophisticated understanding of how these advantages and disadvantages compare, and how this balance shifts depending on different conditions, such as the level and form of liberalisation implemented and the sectoral context in which the process of liberalisation is carried out.

This study has attempted to provide a first step toward making such a comparison by analysing the development of cross-border passenger railway services in the European Union. On one hand, one would expect liberalisation, through its creation and integration of markets (which span across borders) aimed at realising greater efficiency, to positively impact the development of cross-border railway services. On the other hand, however, based on liberalisation's perceived lowering of the quality of services, one would expect it to result in a deterioration of these cross-border services. Liberalisation in the railway sector in the EU has been carried out at different moments in time, to different levels, and in different forms by the Member States, which also differ with respect to the level to which their railway sectors are developed. Therefore, the case of cross-border railway services allows not only for a direct comparison between the respective strengths of liberalisation's main positive and negative effects, but also for the analysis of the effect of different levels and forms of liberalisation and the sectoral contexts in which liberalisation was carried out on this balance between its advantages and disadvantages.

The results show convincingly that overall, liberalisation's positives outweigh its negatives with regard to the development of cross-border railway services. In general, liberalisation positively impacts the development of the number of these services. What is more, is that it appears to do so at all levels: greater levels of liberalisation result in greater improvements. This is found to hold for the different levels of liberalisation overall (no liberalisation, vertical separation, and horizontal separation), as well as for the different levels of vertical separation (no vertical separation, accounting separation, and institutional separation) and those within entry-level competition (no entry-level competition, *de jure* entry-level competition, *de facto* entry-level competition). H1 (*Higher levels of liberalisation improve the development of cross-border railway services in the European Union*) is therefore corroborated, whilst H2 (*Higher levels of liberalisation deteriorate the development of cross-border railway services in the European Union*) is rejected.

With regard to the impact of the different forms of liberalisation on this effect, the study finds no evidence that there is a difference between the impacts of competitive tendering and entry-level competition, as both are found to have a large and significant positive impact on the development of cross-border railway services. Therefore, H3 (*Liberalisation based on a system of competitive tendering has a more positive effect on the development of cross-border railway services in the European Union than liberalisation based on a system of entry-level competition*) is rejected. This means that contrary to expectation, whether competition is ever-present or only present in the process of bidding for tenders does not appear to impact the strength of the negative effect that liberalisation has on services as a result of the presence of competition and the resulting decline in investments. Alternatively, the positive impact of liberalisation on cross-border services through the

creation and integration of markets may be so strong that any differences with regard to liberalisation's negative impact on services - caused by the implementation of different forms of liberalisation - are nullified.

However, the context of liberalisation, specifically that relating to the level of development of the railway sector, is found to be crucial in determining the extent to which liberalisation has a positive effect on the development of cross-border railway services. The effect is much weaker for borders between two post-socialist countries than for borders where only one or neither of the countries are post-socialist. Therefore, given that post-socialist Member States generally have less well-developed railway sectors, H4 (*Liberalisation has a more positive effect on the development of cross-border railway services in the European Union between countries with more well-developed railway sectors than between those with less well-developed railway sectors*) is corroborated.

In summary, with regard to the case of cross-border passenger railway services, liberalisation's positive impacts appear to outweigh its negative impacts for all levels and forms of liberalisation implemented. However, the same does not hold for the sectoral context in which liberalisation is implemented: if liberalisation is implemented in less well-developed railway sectors, there appears to be little effect on the development of cross-border passenger railway services at all, either positive or negative.

The main limitation of these results is that it is very difficult to generalise them to sectors other than the railway sector, and even to cases other than the case of cross-border passenger railway services. As the existing studies on liberalisation show, liberalisation's exact impacts differ from sector to sector. Having said that, the existing literature also indicates that inevitably, liberalisation has positive and negative consequences, which often can be interpreted as increases in efficiency on one side and a deterioration of the quality of services on the other side. Further research will need to be conducted to see whether the positive side of liberalisation outweighs its negative side in other sectors too. What can be concluded more generally from this study, however, is that the context in which liberalisation is carried out, in particular that relating to the level of development of the sector in which liberalisation is implemented, matters a great deal to the final outcome. In this particular case, the same cannot be said for the level or form of liberalisation, as the effect appears to be positive for all levels and forms, but this might well be different in other sectors. These are principles which so far have been left unexplored but which demand further studying. Evidently, this study finds that it is both necessary and fruitful to move beyond highlighting liberalisation's advantages and disadvantages independently of one another, and move toward studying those conditions which determine whether liberalisation can be considered an effective way forward within different sectors: that is, analysing under what conditions the positive and negative impacts of liberalisation increase and decrease, especially in relation to one another.

Future research should therefore focus on further developing these conditions. This could be through research into the effects of different levels and forms of liberalisation or the economic context in which it is carried out, or through other possible conditions such as the extent to which liberalisation has already been implemented in other sectors in a given country. Ideally, one would find other cases in which liberalisation's positive and negative effects overlap. If these are difficult to find, however, an alternative approach would be to focus on the impacts of these conditions on a single established effect of liberalisation, either positive or negative. Either way, rather than pointing solely to liberalisation's advantages or disadvantages, further research should aim to provide a more nuanced account of the conditions which shape the impacts of liberalisation, as this study has shown that these conditions can influence the overall outcome of liberalisation considerably.

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Appendixes

Appendix 1 – Liberalisation Levels (1989 – 2019)

Table 9 – Liberalisation Levels 1989

1989							
		Vertical Separation	Tendering		Entry-Level Competition		
Austria		None	No		None		
Belgium		None	No		None		
Bulgaria		None	No		None		
Croatia		None	No		None		
Czech Republic		None	No		None		
Denmark		None	No		None		
Estonia		None	No		None		
France		None	No		None		
Germany		None	No		None		
Greece		None	No		None		
Hungary		None	No		None		
Italy		None	No		None		
Latvia		None	No		None		
Lithuania		None	No		None		
Luxembourg		None	No		None		
Netherlands		None	No		None		
Poland		None	No		None		
Portugal		None	No		None		
Romania		None	No		None		
Slovakia		None	No		None		
Slovenia		None	No		None		
Spain		None	No		None		
Sweden		None	No		None		
United Kingdom		None	No		None		

Table 10 – Liberalisation Levels 1999

1999							
	Vertical Separation	Tendering		Entry-Level Competition			
Austria	Accounting separation	No		None			
Belgium	Accounting separation	No		None			
Bulgaria	None	No		None			
Croatia	None	No		None			
Czech Republic	None	No		None			
Denmark	Institutional separation	No		None			

Estonia	None	No	None
France	Institutional separation	No	None
Germany	Accounting separation	Yes	None
Greece	Accounting separation	No	None
Hungary	None	No	None
Italy	Accounting separation	No	None
Latvia	None	No	None
Lithuania	None	No	None
Luxembourg	Accounting separation	No	None
Netherlands	Institutional separation	Yes	None
Poland	None	No	None
Portugal	Institutional separation	No	None
Romania	None	No	None
Slovakia	None	No	None
Slovenia	None	No	None
Spain	Accounting separation	No	None
Sweden	Institutional separation	No	None
United Kingdom	Institutional separation	Yes	De facto

Table 11 – Liberalisation Levels 2009

2009			
	Vertical Separation	Tendering	Entry-Level Competition
Austria	Accounting separation	No	De jure
Belgium	Accounting separation	No	None
Bulgaria	Institutional separation	No	De jure
Croatia	Institutional separation	No	None
Czech Republic	Institutional separation	Yes	De jure
Denmark	Institutional separation	Yes	De jure
Estonia	Accounting separation	Yes	De jure
France	Institutional separation	No	None
Germany	Accounting	Yes	De

	separation			facto		
Greece	Institutional separation	No		None		
Hungary	Accounting separation	No		None		
Italy	Accounting separation	Yes		De facto		
Latvia	Accounting separation	No		De jure		
Lithuania	Institutional separation	No		De jure		
Luxembourg	Accounting separation	No		None		
Netherlands	Institutional separation	Yes		None		
Poland	Accounting separation	Yes		De jure		
Portugal	Institutional separation	Yes		None		
Romania	Institutional separation	No		De jure		
Slovakia	Institutional separation	No		De jure		
Slovenia	Accounting separation	No		De jure		
Spain	Institutional separation	No		None		
Sweden	Institutional separation	Yes		De facto		
United Kingdom	Institutional separation	Yes		De facto		

Table 12 – Liberalisation Levels 2019

2019						
	Vertical Separation	Tendering		Entry-Level Competition		
Austria	Accounting separation	No		De facto		
Belgium	Accounting separation	No		None		
Bulgaria	Institutional separation	No		De jure		
Croatia	Institutional separation	No		De jure		
Czech Republic	Institutional separation	Yes		De facto		
Denmark	Institutional separation	Yes		De jure		
Estonia	Institutional separation	Yes		De jure		
France	Institutional	No		None		

	separation					
Germany	Accounting separation	Yes		De facto		
Greece	Institutional separation	No		None		
Hungary	Accounting separation	No		None		
Italy	Accounting separation	Yes		De facto		
Latvia	Accounting separation	No		De jure		
Lithuania	Institutional separation	No		De jure		
Luxembourg	Accounting separation	No		None		
Netherlands	Institutional separation	Yes		None		
Poland	Accounting separation	Yes		De facto		
Portugal	Institutional separation	Yes		None		
Romania	Institutional separation	No		De facto		
Slovakia	Institutional separation	Yes		De facto		
Slovenia	Accounting separation	No		De jure		
Spain	Institutional separation	No		None		
Sweden	Institutional separation	Yes		De facto		
United Kingdom	Institutional separation	Yes		De facto		

Tables based on updated data retrieved from: Ait Ali and Eliasson (2021), Cantos Pastor and Serrano (2010), Casullo (2016), Dionori, Dunmore, Ellis and Crovato (2011), Keim and Cerny (2021), Kirchner and IBM Global Business Services (2011), Ranghetti (2017), and Sanchez, Lorenzo & Martinez (2008).

Appendix 2 – Cross-Border Services (1989 – 2019)

Table 13 – Cross-Border Services by Country (1989-2019)

Spain - Portugal	1989	1999	2009	2019
Guillarei - Valenca	21	21	14	28
Salamanca - Vilar Formoso	28	7	21	7
Badajoz - Abrantes	28	21	0	7
Valencia de A. - Abrantes	14	49	0	0
Ayamonte - Vila Real	0	28	0	0
	91	126	35	42
France - Spain	1989	1999	2009	2019
Cerbere - Port Bou	35	109	98	105
La Tour de Carol - Puigcerda	28	35	0	63
Hendaye - Irun	151	91	42	7
Perpignan - Figueres (HSR)	0	0	0	49
	214	235	140	224
Belgium - France	1989	1999	2009	2019
Mouscron - Tourcoing	77	0	136	113
Tournai - Lille	77	141	117	122
Mons - Aulnoye	84	38	0	7
Jeumont - Aulnoye	49	56	139	14
Brussels - Lille/Paris/London (HSR)	0	203	196	225
	287	438	588	481
Netherlands - Belgium	1989	1999	2009	2019
Roosendaal - Antwerp	262	112	120	117
Maastricht - Vise	133	182	132	124
Rotterdam - Antwerp/Brussels (HSR)	0	28	49	118
Breda - Noorderkempen	0	0	0	112
	395	322	301	471
Netherlands - Germany	1989	1999	2009	2019
Nieuwe Schans - Leer	19	49	56	123
Oldenzaal - Bad Bentheim	75	35	49	68
Arnhem - Emmerich	110	89	69	167
Nijmegen - Kranenburg	35	0	0	0
Venlo - Kaldenkirchen	70	121	112	123
Simpelveld - Aachen	52	0	0	0
Heerlen - Herzogenrath	0	115	123	130
Enschede - Gronau	0	0	222	233
	361	409	631	844
Belgium - Luxemburg	1989	1999	2009	2019

Gouvy - Troisvierges	49	56	56	76
Arlon - Luxembourg	100	157	135	120
Athus - Rodange	0	0	50	240
	149	213	241	436
France - Luxemburg	1989	1999	2009	2019
Longwy - Luxembourg	14	12	40	69
Thionville - Luxembourg	76	138	221	212
	90	150	261	281
Germany - Luxemburg	1989	1999	2009	2019
Igel - Wasserbillig	53	112	143	140
	53	112	143	140
Romania - Bulgaria	1989	1999	2009	2019
Giurgiu - Ruse	21	28	14	91
Negru Voda - Kardam	7	0	0	0
Craiova - Vidin	0	0	0	7
	28	28	14	98
Hungary - Romania	1989	1999	2009	2019
Biharkeresztes - Episcopia Bihor	14	40	35	35
Lokoshaza - Curtici	35	31	70	35
Nyirabrany - Valea lui Mihai	0	21	21	21
Mateszalka - Carei	0	0	14	14
Kotegyan - Salonta	0	0	0	14
	49	92	140	119
Belgium - Germany	1989	1999	2009	2019
Welkenraedt - Aachen	126	115	85	82
	126	115	85	82
France - Germany	1989	1999	2009	2019
Thionville - Trier	20	0	4	4
Forbach - Saarbrucken	71	70	95	103
Strasbourg - Kehl	103	98	42	178
Sarreguemines - Saarbrucken	0	6	38	14
	194	174	179	299
Germany - Austria	1989	1999	2009	2019
Lindau - Bregenz	84	105	98	112
Kempton - Reutte	42	70	63	56
Garmisch - Ehrwald	56	63	53	105
Mittenwald - Scharnitz	88	89	56	90
Rosenheim - Worgl	105	98	112	65
Freilassing - Salzburg	211	210	246	207

Simbach - Branau am Inn	42	0	52	81
Passau - Wels	84	77	153	165
	712	712	833	881
Estonia - Latvia	1989	1999	2009	2019
Valga - Valmiera	14	0	21	14
	14	0	21	14
Latvia - Lithuania	1989	1999	2009	2019
Jelgava - Siauliai	7	18	0	2
Daugavpils - Turmantus	7	19	7	5
	14	37	7	7
Lithuania - Poland	1989	1999	2009	2019
Sestokai - Suwalki	7	14	0	5
	7	14	0	5
Sweden - Denmark	1989	1999	2009	2019
Malmo - Copenhagen	0	0	499	462
	0	0	499	462
Denmark - Germany	1989	1999	2009	2019
Padborg - Flensburg	28	52	76	54
Rodby - Puttgarden	56	35	42	28
Gedser - Warnemunde	28	0	0	0
Trelleborg - Sassnitz	14	14	0	0
Tonder - Niebull	0	0	58	65
	126	101	176	147
Poland - Czech Republic	1989	1999	2009	2019
Lubawka - Kralovec	0	0	0	28
Walbrzych - Mezimesti	0	28	0	8
Klodzko - Miedzylesie	21	14	14	34
Glucholazy - Jesenik	0	0	28	28
Glucholazy - Tremesna	0	0	28	28
Katowice - Bohumin	35	49	49	70
Cieszyn - Cesky Tesin	0	0	7	63
Szklarska Poreba - Hacharov	0	0	0	62
	56	91	126	321
Czech Republic - Slovakia	1989	1999	2009	2019
Cesky Tesin - Cadca	67	77	84	126
Horni Ledic - Puchov	42	49	21	42
Vlarsky Prusmyk - Trenc Tepla	0	0	27	14
Breclav - Kuty	106	91	77	105
	215	217	209	287

Poland - Slovakia	1989	1999	2009	2019
Zwardon - Cadca	0	14	21	33
Muszyna - Plavec	35	21	21	4
Lupkow - Medzilaborce	0	0	6	7
	35	35	48	44
Austria - Slovakia	1989	1999	2009	2019
Marchegg - Bratislava	14	28	140	133
Bruck an der Leitha - Bratislava	0	0	149	152
	14	28	289	285
Hungary - Slovakia	1989	1999	2009	2019
Rajka - Bratislava	0	28	14	34
Szob - Sturovo	56	63	70	56
Hidasnemeti - Kosice	21	40	35	14
Salgotarjan - Filakovo	14	33	22	0
Komarom - Komarno	21	21	0	0
Satoraljaujhely - Slovenske NM	0	14	0	0
	112	199	141	104
Austria - Slovenia	1989	1999	2009	2019
Villach - Jesenice	61	54	49	35
Spielfeld - Maribor	28	31	56	45
Bleiburg - Maribor	0	0	0	11
	89	85	105	91
Croatia - Slovenia	1989	1999	2009	2019
Sapjane - Pivka	54	28	20	21
Zagreb - Zidani Most	124	56	42	35
Ormoz - Cakovec	0	49	12	12
Buzet - Divaca	63	7	12	16
	241	140	86	84
Slovenia - Italy	1989	1999	2009	2019
Sezana - Villa Opicina	40	28	7	52
	40	28	7	52
Austria - Italy	1989	1999	2009	2019
Innsbruck - Brennero	143	177	174	49
Lienz - San Candido	49	42	70	100
Villach - Tarvisio	54	42	28	70
	246	261	272	219
France - Italy	1989	1999	2009	2019
Modane - Oulx	70	74	21	28
Breil sur Roya - Limone	56	70	91	16

Menton - Ventimiglia	115	38	28	199
	241	182	140	243
Austria - Hungary	1989	1999	2009	2019
Bruck an der Leitha - Hegyeshalom	28	70	147	84
Vienna - Sopron	20	144	305	102
Feldbach - Szentgotthard	28	45	86	83
	76	259	538	269
Germany - Czech Republic	1989	1999	2009	2019
Bad Schandau - Rumburk	0	0	0	61
Bad Schandau - Decin	56	56	119	112
Zittau - Liberec	21	54	75	114
Zittau - Varnsdorf	0	33	30	114
Chemnitz - Vejprty	0	28	18	4
Johanngeorgenstadt - Potucky	0	14	44	44
Plauen - Frantiskovy Lazne	14	0	56	35
Hof - Frantiskovy Lazne	0	0	0	54
Marktrewitz - Cheb	14	42	72	81
Furth im Wald - Domazlice	14	35	35	49
Bayerisch Eisenstein - Zelezna Ruda	0	43	87	63
	119	305	536	731
Czech Republic - Austria	1989	1999	2009	2019
Breclav - Hohenau	21	63	145	142
Satov - Retz	0	0	59	57
Ceske Velenice - Gmund	21	28	50	56
Rybnik - Summerau	14	42	49	56
	56	133	303	311
Slovenia - Hungary	1989	1999	2009	2019
Hodos - Zalaegerszeg	0	0	49	35
	0	0	49	35
Croatia - Hungary	1989	1999	2009	2019
Koprivnica - Gyekenyes	14	21	42	21
Beli Manastir - Magyarboly	14	21	21	24
Kotoriba - Murakeresztur	0	35	0	0
	28	77	63	45
Bulgaria - Greece	1989	1999	2009	2019
Kulata - Promachon	14	7	21	0
Svilengrad - Ormenion	7	7	7	0
	21	14	28	0

United Kingdom - France	1989	1999	2009	2019
London - Calais	0	191	195	188
	0	191	195	188

Tables based on data retrieved from: Fox (1999), Fox (2009), Fox and Price (1989), and Potter and Woodcock (2019).